

A PERMIAN BLASTOID FROM BELFORD, NEW SOUTH WALES.

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(Plate iv; one Text-figure.)

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During a recent visit to the Hunter River district the writers collected two specimens of radial plates of a Blastoid. Since no Blastoid has been described so far from the Permian of New South Wales, it seems advisable to place on record the occurrence of this fossil. Probably further collecting will reveal other and better specimens.

One specimen, (A) (39158, Australian Museum Collection), comes from the hillslope about 100 yards west of Jump-Up Creek, in Portion 14, Parish of Belford, 2½ miles north of Belford Railway Station; the other, (B) (39159, Aust. Mus. Colln.), comes from Jump-Up Creek, below the Railway Bridge, half a mile west of Belford. They are both from the same horizon, the Fenestella Shale Bed, in the Upper Marine (Permian) Series.

TRICOELOCINUS (?) BELFORDI, n. sp.

The specimens are external moulds in sandy shales containing abundant Fenestrellinidae and crinoid stems. Each specimen consists essentially of a single large radial or forked plate, with portion of the ambulacral plates.

In specimen A the radial plate is 3.5 cm. in length, and 1.7 cm. in width, the ratio limb to body being 15 to 20. The inter-radial sutures are comparatively straight. In profile the radial bends below the radial sinus at an angle of 155° between the upper (ambulacral) area and the lower (aboral) portion; at right angles to this the angle between the lateral parts of the plate is approximately 130°. Fine concentric striations occur parallel to the marginal sutures (Plate iv, figure 1).

Specimen B shows a smaller radial plate, the length being 2.5 cm. and width 1.0 cm., the ratio of limbs to body being about 11 to 14. This plate also shows fine concentric ornamentation; it has been somewhat flattened and has cracked across its lower portion (Plate iv, figure 3).

The ambulacra are remarkably narrow, being no more than 2 mm. in width. Specimen A (Pl. iv, fig. 1) shows the position of about 20 small side plates arranged alternately in two rows along the lower part of the ambulacrum. The specimen shows tiny ridges representing the boundaries of the side plates and also the central food groove. The side plates were set at an angle of about 40 degrees with the axis of the ambulacrum. Probably there were at least 40 of these side plates covering the whole length of the lancet plate. The thickening of the lateral ridges into small tubercles near the outer margins of the ambulacrum suggests the former presence of marginal or hydrospire pores between the side plates (Plate iv, fig. 2).

Specimen B does not show the side plates in the ambulacral region, but is the mould of a deeper portion. Two longitudinal grooves (Pl. iv, fig. 3) probably indicate the margins of the lancet plate.

No trace of outer-side plates or any internal structures are present, and no specimens of the basals or deltoids are yet known.

Systematic position.

The distinctive shape of the radial plate, the very narrow ambulacra and the fact that the lancet plate is completely covered by the side plates place it immediately in the family Troostoblastidae (Etheridge and Carpenter, 1886, p. 190), which corresponds with Bather's Series B. Troostoblastida, Family 1. Troostocrinidae (Lankester, 1900, p. 92).

Of the three genera belonging to this family, *Troostocrinus* Shumard, *Metablastus* Etheridge & Carpenter, and *Tricoelocrinus* Meek & Worthen, it appears to be closest to *Tricoelocrinus*, to which it may tentatively be referred in the absence of further details.

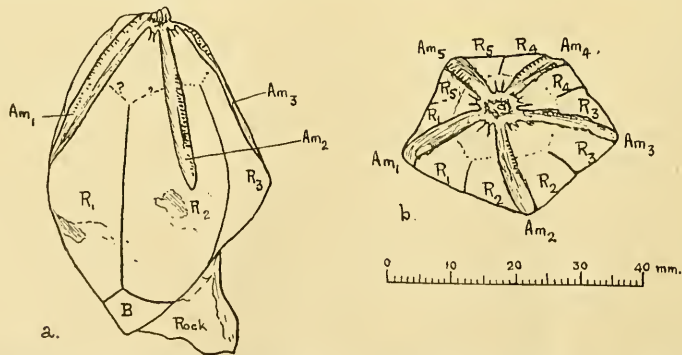
The characters of the radial plate and the ambulacrum distinguish this Blastoid from any described species; we therefore propose for it the name *Tricoelocrinus* (?) *belfordi*, n. sp.

We designate specimen A (39158, Australian Museum Collection) as the type.

Other occurrences.

A specimen of a Blastoid was found by Dr. E. C. Case (see David, 1923, footnote, p. 19) in the Fenestella Shales in the Railway Cutting one mile west of Branxton Railway Station. This locality is three miles to the east of the Belford occurrence. So far as we are aware there is no recorded description of this specimen and its whereabouts is unknown to us. Mr. H. G. Gooch took, for Professor David, a series of 16 photographs of the specimen at the time of its discovery, some of which are reproduced in Plate iv, figures 4, 5, and a plaster cast of this specimen is in the Australian Museum, Sydney. The cast is imperfect and does not show some of the details of the ambulacra, which are clearly visible in the photographs. The accompanying diagram (Text-fig. 1) is based on an examination of the photographs of the original specimen and of the plaster cast.

The specimen is almost complete and is about 5.0 cm. in height; in median cross-section it is sub-pentagonal (Text-fig. 1b) and measures 3.3 cm. by 2.2 cm.



Text-figure 1.—Diagrammatic sketch of Blastoid from Branxton, based on plaster cast and photographs of the original specimen (which is now missing). B, basal plate; R_1, R_2, \dots radial plates; Am_1, Am_2, \dots ambulacra.

The calyx shows one of the larger basal plates and five radial plates (which closely resemble those found at Belford). The inter-radial sutures are distinct in the cast and are straight, but the boundaries against the deltoids are obscure. At the tip of each inter-ambulacral area are two small grooves, as shown in the Text-figure. There are five ambulacra, four of which are 3.0 cm. in length, the fifth (Am_5) being 2.5 cm.; the width is fairly uniform, and amounts to 2.5 mm. The photographs show the casts of the (?) side plates, 20 per centimetre occurring on each side of the ambulacrum, indicating about 60 along the whole length of the lancet plate.

The apical parts are not clear; there appears to be a protuberance in the centre of the oral region.

Etheridge (in Jack and Etheridge, 1892, pp. 210-213) described three Blastoids from the Gympie Beds of Rockhampton District, Queensland, which he identified as *Mesoblastus ? australis* Eth. fil. (p. 210; Pl. 44, fig. 2), *Granatocrinus ? wachsmuthii* Eth. fil. (p. 211; Pl. 7, fig. 10), *Tricoelocrinus ? carpenteri* Eth. fil. (p. 212, Pl. 44, fig. 3). These specimens are not available to us for direct comparison, but the description and illustration of *Tricoelocrinus ? carpenteri* suggest a close resemblance to the Belford specimen.

In 1906 T. Griffith Taylor described in These PROCEEDINGS, specimens of the radial and basal plates and portions of the ambulacra of a Blastoid collected 2½ miles north of Clarence Town, New South Wales, which he provisionally classed with *Metablastus*. It shows certain resemblances to the specimen under consideration in the size and proportions of the ambulacra and the radial plates, but differs in the arrangement of the side plates and in that the limbs of the radial plate of the Belford specimen are relatively wider.

Geological age.

The Belford specimens come from the Fenestella Shale Bed, which forms part of the Belford 'dome' (Morrison and Jones, 1925, p. 128; Morrison and Raggatt, 1928, p. 111). This horizon is about 1,000 feet below the Muree Rock, and thus occurs in the Branxton Stage of the Upper Marine Series. The upper Marine Series comprises that portion of the Kamilaroi System (David and Sussmilch, 1931, p. 483) whose age is unquestionably Permian; Middle Permian according to David (1932, Table opp. p. 62).

The Rockhampton specimens described by Etheridge come from the 'Gympie Series', an old term, which includes rocks of various ages (Bryan, 1928, p. 33). Some part of the series is equivalent to the Lower Marine Series of the Kamilaroi (David, 1932, Table opp. p. 62) and may be of Permian age and it is probably from these beds that the Blastoids were collected.

The Clarence Town specimens described by Taylor come from the Glenwilliam Beds of the Burindi Series, and are of Lower Carboniferous age.

Permian Blastoids are known from Timor (J. Wanner, 1922, 1924, 1931) and from the Urals (Yakovlev, 1926), but none so far described appears to show any close resemblance to the Australian specimens.

Acknowledgements.

We are indebted to Dr. H. G. Raggatt for informing us of the best collecting grounds in the Fenestella Beds, and to Mr. H. O. Fletcher, of the Australian Museum, Sydney, for the loan of the cast of the Branxton specimen and for his suggestion as to the nature of the partially exposed plate, which was fully

justified on the developing out of the specimen. The photographs of difficult subjects were taken by Mr. H. G. Gooch, of the Department of Geology, Sydney University, to whom our best thanks are due.

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EXPLANATION OF PLATE IV.

Fig. 1.—External mould of radial plate of Blastoid (*Tricoelocrinus* (?) *belfordi*, n. sp.). Showing concentric ornamentation of radial plate and portion of ambulacrum. Locality 2½ miles north of Belford, N.S.W. × 2.

Fig. 2.—Enlargement of ambulacrum given in Fig. 1, showing mould of food groove, side plates and marginal pores. Locality, 2½ miles north of Belford, N.S.W. × 10½.

Fig. 3.—External mould of portion of radial plate of *Tricoelocrinus* (?) *belfordi*, showing concentric ornamentation. The ambulacrum shows the position of the lancet plate. Locality, ½ mile west of Belford, N.S.W. × 2.

Fig. 4.—Side view of Blastoid found by Dr. E. C. Case, 1923. The arrangement of the plates is indicated in Text-fig. 1, p. 168. Locality, Railway Cutting, 1 mile west of Branxton, N.S.W. Nat. size.

Fig. 5.—View of the oral surface of Blastoid in Fig. 4, showing arrangement of the ambulacra. Locality, Railway Cutting, 1 mile west of Branxton, N.S.W. Nat. size.

All specimens come from the same horizon, the Fenestella Shales, Upper Marine Series, Permian. Photographs by H. G. Gooch.